

INELASTIC COLLISIONS

Purpose:

To analyze the motion of two low friction carts during an inelastic collision and verify that the law of conservation of linear momentum is obeyed.

Equipment:

Computer with Logger Pro software, LabPro interface, motion detector, horizontal track, two carts, 500 g mass, triple beam balance, bubble level

Introduction:

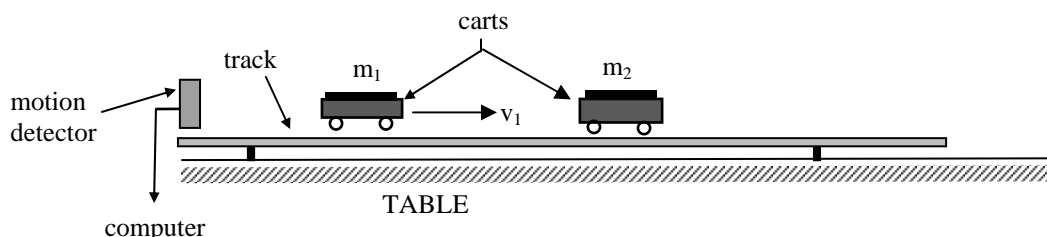
This experiment uses the carts and track as shown in the figure. If we regard the system of the two carts as an isolated system, the momentum of this system will be conserved. If the two carts have a perfectly inelastic collision, that is, stick together after the collision, the law of conservation of momentum says

$$P_i = P_f$$

where 1) $P_i = m_1v_1 + m_2v_2$

and 2) $P_f = (m_1 + m_2)V$

where v_1 and v_2 are the velocities before the collision, m_1 and m_2 are the masses of each cart, and V is the velocity of the combined mass after the collision.



Procedure:

1. Set up the apparatus as shown in the figure. Use the bubble level to verify that the track is as level as possible. Place each cart on the triple beam balance and make a record of each mass.
2. Connect the LabPro interface to the computer and the motion detector to the DIG/SONIC2 port on the LabPro. Turn on the computer (your instructor will help you log on this first time). On the desktop you should see an icon called **Physics Apps**. Double click on this icon to open the folder that contains various physics oriented software packages. Double click on the icon named **Logger Pro** to start the software that we will use for this lab. Once the Logger Pro software has started select **FILE/OPEN** (with the mouse) and then open the **Mechanics** folder by double clicking on its icon. When this folder opens, double click on **Motion Detector** to open this file. You should now see, on the monitor, a graph of position vs time.
2. First, check to see that the motion detector is working properly by clicking the **Collect** button to start collecting data. Move the cart nearest the detector back and forth a few times while observing the position vs time graph being drawn by the computer. Does it provide a reasonable graph of the motion of the cart? Remember to be aware of unwanted reflections caused by objects in between the motion detector and the cart. (The scales on the graph can be changed if you desire by pointing the mouse at the upper and lower limits on either scale and clicking on the number to be changed. Enter in the desired numbers and push the **Enter** key.) Also, position the carts so that their velcro pads are facing each other. This will insure that they will stick together after the collision.
3. Using the triple beam balance, measure the mass (m_1 and m_2) of each cart. Record these masses in the table below. With the second cart (m_2) at rest give the first cart (m_1) a moderate push away from the

